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Beyond Freedom and Dignity at 40: Comments on Behavioral Science, the Future, and Chance (2007)

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Forty years after the publication of *Beyond Freedom and Dignity* (Skinner, 1971) and the continuing growth of behavior analysis, the future of humanity and the role of behavioral science in that future remain uncertain. A recent paper by Chance (2007) documented a shift in Skinner's views during the last years of his life. Skinner had long advocated a science and technology of behavior for finding and engineering solutions to cultural and global problems and advancing human development. This optimism had given way under a gradual realization that the science of behavior was in fact showing how such problems were unlikely to be solved in time to avert a variety of possible disasters. Chance described nine behavioral phenomena that appear to interfere with effective problem-solving behavior on a large scale and in effective time frames. These phenomena are reviewed toward an analysis of common themes. Research is also reviewed that involves nonverbal, verbal, and cultural contingencies that may lead to applications designed to address the common themes. Problems and strategies of implementation are also discussed. The challenges are daunting, but may nevertheless be regarded as technical problems best suited for a science and technology of behavior.

Key words: behavior analysis, cultural analysis, cultural contingencies, B. F. Skinner

Forty years ago, the utopian vision of B. F. Skinner found its clearest and most comprehensive expression with the publication of *Beyond Freedom and Dignity* (1971). Earlier works (e.g., Skinner, 1948, 1953) and subsequent writings (e.g., Skinner, 1987, 1989) have also examined the roles of behavioral science in securing a future for human global civilization (e.g., Altus & Morris, 2009).

Beyond Freedom and Dignity (Skinner, 1971) was the centerpiece of Skinner's science-based utopian vision (e.g., Altus & Morris, 2009; Day, 1992). In later years, however, Skinner began to express increasing urgency regarding global problems and described the role of behavioral science in addressing those problems in a more cautious tone (e.g., 1987). Chance (2007) has recently documented a qualitative shift in Skinner's views during the last years of his life regarding the future of the human species and the role of behavioral science in that future. In an interview with Chance, Skinner revealed that his previous optimism had given way under a gradual realization that, ironically, the very science of behavior that suggested how such problems could be solved, in fact, showed how they were unlikely to be solved in time to avert a variety of possible disasters. In discussing the change in Skinner's views, Chance considered a number of findings arising from behavior-analytic science that might be seen as supporting Skinner's pessimism. Chance described nine findings—contingencies that involve maladaptive behavioral phenomena—that appear to interfere with effective problem-solving behavior on a large scale and in effective time frames.

The purpose of Chance's (2007) paper, however, was not simply to describe Skinner's wry pessimism regarding human global civilization, along with a sobering review of some of the science-based phenomena involved in its demise. The thrust of Chance's essay was to challenge the behavior-analytic scientific commu-

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nity to show how Skinner was wrong; that is, to describe how the science of behavior in fact reveals ways in which the problems that await human global civilization may be approached effectively and in time to avert global catastrophe.

The Daunting Scientific Task

Threats to the environment, overpopulation and the depletion of resources, and the proliferation of nuclear weapons are among the serious problems facing human global civilization. Is it possible that evolutionary biology contains a quirk in which the processes and contingencies that enable an advanced global technical culture to develop also contain the seeds of its destruction? Is it possible that after reaching the heights of civilization, the mastery and dominance of resources combine with aggressive tendencies and behavioral processes acting over short time scales to bring cultural progress to a halt within a millennium or two? If so, then perhaps the problem would be universal, in the literal sense that whether intelligent life in the universe is frequent or rare, advanced planetary civilizations may be a transient phenomenon when they do occur.

It is difficult to imagine any effective way to address such issues except through behavioral science. In taking up Chance's (2007) challenge, perhaps contemporary behavior analysis may find that the story of the quirks of biological and cultural evolution has a twist in the plot, something that changes the story.

The challenge, however, may be regarded as having three parts. First, there must be an empirically based behavioral principle or process that may be shown to regulate or affect the maladaptive behavioral phenomena on Chance's list, as well as other related challenges. This might point to a sort of large-scale strategic solution to future threats "in principle." Second, there is the enormous challenge of implementation. That is, how could the means for changing behavior, for acting now to avert a dangerous future threat, actually be put into practice? Third, how may all of this be implemented in time for it to have a productive effect? The three issues may be combined into what Skinner (1982) referred to as "perhaps the most terrifying question in the history of the human species" (p. 8); namely, we may know that certain things may happen in the future and that action is needed now, but why should the action occur?

This paper is organized in terms of three goals. The first is to review briefly the phenomena and contingencies on Chance's (2007) list toward a possible simplification of the number and types of problems involved. Second, I suggest that recent research illustrates behavioral processes in which long-term contingencies can make effective contact with immediate behavior. The third goal is to examine certain problems of the implementation of adaptive cultural variations not addressed directly by Chance but which were part of Skinner's later writings (e.g., Skinner, 1982).

The following discussion will obviously not be remotely sufficient to "prove Skinner wrong" in his later pessimism, which was Chance's challenge to behavior analysts. Rather, the general strategy is to review some of the contingencies involved in the larger problem, make a few suggestions based on research, and thereby, perhaps, promote further discussion.

Is it foolish to pursue such questions when the problems are of such magnitude and complexity, and yet we are still working to understand the complex and dynamic behavior of a pigeon in an operant chamber? Moreover, we have only recently begun an analysis of complex verbal behavior, which would seem to be necessary to address these problems. There are two answers. First, in a real

sense, behavior analysts are already working on such questions, in that one of the by-products of a pragmatically based experimental and applied science is the production of adaptive cultural practices (e.g., Biglan, 1995). Second, it is because of the magnitude of the problems that they should be addressed by whatever scientific means possible (e.g., Chance & Heward, 2010). Not to address Chance's (2007) challenge, that is, to avoid the most pressing behavioral problems facing humanity, is to forfeit the future, because science is the only means possible for effective solutions, and behavioral science is the only science that may have the means and methods available for effective action (Skinner, 1971).

CHALLENGES AND CONTINGENCIES

As Chance (2007) noted, a list of problematic behavioral phenomena prepared by Skinner would probably have been different than the one Chance presented. A brief review of the list prepared by Chance is offered here as a way of attempting a crude organization of the larger processes, contingencies, and effects involved. This section is not a review of the relevant research literatures, but is rather a starting point for a more detailed analysis. The following is rank ordered according to a rough interpretation of the item's importance or contribution to the seriousness of the challenge.

Immediate Consequences Outweigh Delayed Consequences

Perhaps the most insidious and pervasive phenomenon to be addressed is the tendency for immediate consequences to have a larger effect on behavior than delayed consequences do. More to the point, smaller, more immediate consequences outweigh larger, more delayed consequences. This effect, often called *temporal discounting* (or *delay discounting*), has been the subject of a great deal of research in behavior analysis, as well as in the fields of economics and cognition (for an excellent review for behavior analysts, see Critchfield & Kollins, 2001).

Temporal discounting is a pervasive phenomenon and may be seen in both nonhuman and human behavior (Critchfield & Kollins, 2001). In terms of the observation of everyday behavior, it may be seen when the presented pizza is eaten in spite of the long-term and highly desired goal of losing weight, or when government officials work on high-visibility, short-term local projects but defer important but complex, long-term work on environmental problems or infrastructure.

The effect might be the result of an evolutionary history in which behavioral contingencies that work over short time horizons were originally the more important for survival, in the sense that staying alive in the short term was necessary for reproductive success in the longer term. The effect may also be seen in some of the other phenomena to be considered below.

Susceptibility to Social Reinforcement Can Incline Us Toward Extreme Views

Chance (2007) cited evidence that people with extreme views tend to seek out others with similar views, and under certain conditions the views may become more extreme through the social interactions that result. This phenomenon may be related to temporal discounting, in that more immediate, frequent, and higher magnitude verbal or social reinforcement would likely result from verbal or social interactions with those with similar verbal histories and repertoires. The immediate reinforcement that differentiates more extreme views can be compared to the delayed and probabilistic verbal or social reinforcement, and the response cost, of communicating

with those outside the group. Such limited-focus contacts could also be maintained by the avoidance of aversive social interactions with those outside the group.

Strong Aversives Presented Abruptly Prompt Appropriate Action, but Strong Aversives Following a Long String of Aversives that Gradually Increase in Strength Often Do Not

In the 1950s, if the traffic in major metropolitan areas had suddenly changed such that commuters now had to take a 2-hr commute both to and from work, there would surely have followed outrage and demands for immediate change. In many cities today such conditions are to be expected.

The effect is well known to behavior analysts, in that basic research has shown that punishment is more effective if the punisher is presented initially at a higher magnitude, compared to beginning at a lower magnitude and gradually increasing it as the individual's responding adapts and recovers (e.g., Martin & Pear, 2003; Sidman, 2001). As Chance (2007) noted, for example, an abruptly worsening environment is more likely to produce behavior changes than an environment that worsens very slowly.

Consequences for the Individual Usually Outweigh Consequences for Others

This statement may be too general to be assessed properly. First, the specific classes of behaviors affected by the relevant classes of functional consequences for both the individual and others would need to be examined. Simple social interactions between one individual and another, for example, involve the reinforcement of behaviors of both individuals. This suggests a competitive situation in which certain consequences may be available to or affect the behavior of one individual at the expense of the other. However, individuals also "work for the benefit of others" when that work is reinforced by the benefits (e.g., Baum, 2005; Skinner, 1953, 1971).

The former phenomenon may also be related to temporal discounting in the sense of immediate versus mediated reinforcement. The social reinforcement that may occur from sharing an acquired reinforcer with someone else is delayed and complex compared with the more immediate and direct effects on behavior if the reinforcer is not shared.

Simple, Familiar Ideas That Are Wrong Are Often Preferred Over Complex, Alien Ideas That Are Correct

Astrology continues to be more popular than astronomy. Creation stories of various sorts are often preferred over the findings of cosmology and evolutionary biology (for a discussion of many such examples, see Sagan, 1996). This phenomenon may be related, in part, to temporal discounting, in that the simpler verbal repertoire is readily and rapidly acquired, and once differentiated, is likely to be easily discriminated and reinforced by the relevant verbal community. Chance's (2007) summary description of the alternative as "complex, alien" implies that the effective verbal repertoire takes much longer to acquire and with greater response cost, and would involve a verbal repertoire, training, and locations beyond the former verbal community.

In the Absence of Countercontrol, the Use of Aversives Tends to Reinforce the Behavior of Those Who Use Them

The use, or attempted use, of punishment and negative reinforcement in human affairs is widespread (e.g., Sidman, 2001; Skinner, 1971). Behavior analysis has made great progress in clarifying the processes, contingencies, and complexities involved (e.g., Dinsmoor, 2001, and

commentaries; Martin & Pear, 2003; Sidman, 2001). The general effect may be another example of temporal discounting. The deliberate construction of operant behavior through positive reinforcement requires effective and functional reinforcers, skill, and time. The resulting changes in behavior that would reinforce the use of such practices in the individual that uses them is therefore delayed, compared to the more immediate effects of aversive control. In the case of negative reinforcement or punishment, functional aversive events are readily available (e.g., intensive yelling or hitting), and whether or not the attempt by one person to punish or negatively reinforce a particular response class in another person is functional or effective, whatever changes in behavior that do occur immediately or in the short term are likely to reinforce the attempts. In other words, reinforcement for the controller's behavior through longer term behavior construction via appetitive control tends to be discounted because of its delay, in favor of the more immediate (if maladaptive) effects of aversive control (e.g., Martin & Pear, 2003; Sidman, 2001; Skinner, 1953, 1971). Such tendencies that favor the use of aversive control have served to emphasize the importance of countercontrol (e.g., Sidman, 2001; Skinner, 1971) in its various unplanned and planned forms.

Coincidental Events Often Strengthen Ineffective Behavior

The contribution of coincidental reinforcement effects and superstitious behavior (e.g., Leigland, 1996; Ono, 1987; Skinner, 1948; Wagner & Morris, 1987) to the problems facing humanity is difficult to assess. At the level of cultural practices, such effects are undoubtedly tied in complex ways to verbal processes and rule-governed behavior. Its clearest manifestation might be found in the next entry from Chance's (2007) list.

Nearly All People Believe in Supernatural Forces and Entities

Religious or spiritual beliefs and practices may be found in virtually all cultures and throughout the span of human history. Such pervasive behavioral phenomena have also been the subject of interpretation by behavior analysts (e.g., Hayes, 1984; Schoenfeld, 1993; Skinner, 1953). Yet the beliefs and practices themselves can take many forms, from international relief organizations and care for the poor to murderous fundamentalism; from maladaptive isolationist cults to benevolent outreach and the healthful practices of meditation. Campbell's (e.g., 1988) work on mythology and comparative religion has described functions of myths in terms of abstract themes that involve the transmission of adaptive cultural values and practices. The maladaptive effects of certain religious practices, however, may be tied to coercive practices of the group regarding religious text and doctrine.

At least some of the behavioral phenomena involved with such beliefs and practices may be linked to temporal discounting. Acquiring a scientific verbal repertoire, for example, involves considerable response cost and delayed reinforcement (e.g., the origin of life on earth according to evolutionary biology) compared to the more immediate reinforcers available for acquisition of the simpler basic verbal repertoire of most religions (e.g., the origin of life on earth according to religious texts).

Some Chemicals Are Destructively Reinforcing

Human susceptibility to the powerful and destructive effects of drugs is obviously a serious problem, yet strategic options for large-scale solutions may be limited. Short of genetic engineering, the most likely remedies may be in the areas of behavioral clinical treatments and behavior management. Here we may also see

perhaps the most dramatic effects of temporal discounting. The complex, delayed, and uncertain reinforcers that maintain healthy behaviors must compete with the immediate, powerful, and direct reinforcement effects of taking drugs (cf. Critchfield & Kollins, 2001).

Overview

Nearly all of the entries on Chance's (2007) list may be interpreted as complex manifestations of temporal discounting combined in complex ways with various verbal and social or cultural contingencies (also noted by Chance, personal communication, 2009). The aversive adaptation phenomenon appears to be an exception, involving perhaps the process of respondent habituation (e.g., Catania, 1998; Sidman, 2001).

RESEARCH THEMES

Solutions to behavior problems depend on research, even if the problems occur on the largest of scales. The following overview is a brief look at research themes that may provide directions for further research toward potential solutions to the problems on Chance's (2007) list. Given space limitations and the current state of our scientific knowledge about human behavior and contingencies of reinforcement (including verbal and cultural contingences), the descriptions of the research themes are broad and general with illustrative data. They are offered as starting points for more detailed analyses in the areas of basic research, translational research (e.g., Mace & Critchfield, 2010), applied research, and implementation. Three research themes will be considered briefly, all of which entail a wide variety of basic and applied research questions.

The first theme is temporal discounting itself. Basic research on this phenomenon is absolutely essential if the variables of which it is a function are to be identified. An experimental analysis of the contingency dynamics of temporal discounting will be the first critical step toward the development of applications and implementations to human problems in human contexts.

The second theme is verbal behavior and verbal processes. Such processes are at the center of all of the unique characteristics of human behavior, and will obviously play a central role in the solving of the uniquely human problems that potentially threaten all life on this planet.

The third theme is cultural processes. The problems that face human global civilization must be addressed on the cultural level if solutions are to be effective and maintained effectively. A behavioral analysis of cultural processes and cultural practices is in its earliest stages, but progress in research must be made here if adaptive cultural variations are to be discovered, developed, and implemented at the cultural level.

Temporal Discounting

Temporal discounting appears to be involved in most of the problematic behavioral phenomena listed by Chance (2007). Temporal discounting refers to the decreasing effectiveness of functional consequences with increasing delay (see also a related effect, probability discounting; e.g., Green & Myerson, 2004). It occurs in both humans and nonhumans, and has played a central role in discussions of self-control and impulsivity (Critchfield & Kollins, 2001) because of the documented tendency for organisms to choose smaller, more immediate reinforcers over larger delayed reinforcers (e.g., Rachlin & Green, 1972). If we are to ever to construct conditions under which people are more likely to ''take the future into account,'' we must know much more about the variables of which such tendencies are a function.

Temporal discounting might possibly be reduced (i.e., the effectiveness of reinforcement might be maintained over longer delays relative to immediate smaller reinforcers) by conditions that transform the functions of the conditional stimuli involved in the relevant discriminations. The transfer or transformation of stimulus function has been the subject of research on stimulus equivalence relations (e.g., Sidman, 1994) and relational frame theory (Dymond & Rehfeldt, 2000; Hayes, Barnes-Holmes, & Roche, 2001).

For example, Dixon and Holton (2009) employed a multiple baseline design to assess temporal discounting in pathological gamblers before and after a conditional discrimination training procedure. During the initial assessment, one color on a computer screen was correlated with a smaller immediate monetary choice, and another color appeared with larger delayed amount. The conditional discrimination procedure that followed established a derived (untrained, conditional) relation between the former color and "worse than," and the latter color and "better than." Subsequent testing with the background colors showed reduced temporal discounting in all five participants. In other words, conditional discrimination training altered the functions of the contextual stimuli such that the participants were more likely to select the larger delayed amount.

Such research is suggestive, although much more research is needed to clarify such interactions and move toward application and implementation on a larger scale. The point, however, is that a key to addressing the problems of temporal discounting in humans might be found in the verbal, "symbolic" functions of stimuli that are the target of intensive research in such areas as stimulus equivalence relations and relational frame theory. Before translational research can begin to develop specific applications to human contexts and perhaps cultural practices, basic research in which these variables and interactions are clarified is of the utmost importance.

Verbal Processes

Skinner's *Verbal Behavior* (1957) made note of complex verbal phenomena in which relations could occur in the behavior of the speaker without direct training, and that such phenomena were the result of a "long process/history of verbal conditioning" (p. 360). Since that time, behavior analysts have learned much more about such relational phenomena and the conditions under which they develop and occur. As noted above, research on stimulus equivalence relations and derived relational phenomena (e.g., Sidman, 1994), and associated empirical and theoretical developments (joint control, e.g., Lowenkron, 1998; function-altering effects of verbal stimuli, e.g., Schlinger, 1993; relational frame theory, e.g., Hayes et al., 2001; theory of naming, e.g., Greer & Longano, 2010), have increased the scope of the functional analysis of verbal behavior and have produced findings of importance to the interests of both basic and applied behavior analysts.

One of these developments, relational frame theory, is associated with a concurrent development in clinical behavior analysis called acceptance and commitment therapy (ACT). As an evidence-based, behaviorally oriented approach to a wide variety of disorders, ACT has been the subject of a large body of research (e.g., Hayes, Strosahl, & Wilson, 1999). ACT is based on the treatment of a problem that may be at the center of many types of psychopathology, medical problems, and everyday human suffering (e.g., Hayes, Luoma, Bond, Masuda, & Lillis, 2006). The problem, experiential avoidance, refers to the learned tendency for people to attempt to

control and hence to remove aversive private events, such as those falling under the ordinary-language terms of feelings, thoughts, or bodily states. Training involves verbal and nonverbal methods for producing a specific type of discriminative repertoire, which is the ability of the observer to discriminate verbal and bodily events from the abstract, verbally constructed ''self'' (Skinner, 1974) such that painful or aversive private events may be observed and discriminated as events to be accepted and observed and not evaluated, controlled, or (in the case of thoughts) taken ''literally.'' This type of training has been effective in the treatment of such disorders as anxiety, depression, and schizophrenia, and such medical conditions as severe epilepsy, self-management of diabetes, and quality of life among terminal cancer patients, among other conditions (e.g., Biglan, Hayes, & Pistorello, 2008; Hayes et al., 2006; Hayes, Strosahl, & Wilson, in press).

Evidence also suggests that ACT training may have productive effects on social relations. For example, Biglan (2009) described two studies in which ACT training was evaluated as a means of changing problematic social behaviors. In one study (Lillis & Hayes, 2007), ACT was conducted with undergraduate students to target the identification and acceptance of prejudicial thoughts toward other ethnic groups and races. Compared to the traditional approach that involves a lecture on the psychology of racial prejudice, ACT increased students' willingness to approach and engage individuals of other ethnic groups and races. Other measures supported the interpretation of the difference in terms of the effect of ACT discrimination training on the ''deliteralization'' of racist thoughts.

Another study (Hayes et al., 2004) examined the problem of prejudice and stigmatizing attitudes of drug abuse counselors toward those receiving counseling. An ACT workshop for the counselors was compared with a more traditional workshop that involved multicultural sensitization training. ACT had greater effects in reducing stigmatization of the clients, and also had greater effects in reducing feelings of burnout among the counselors.

Biglan (2009) has suggested that if such findings are supported by ongoing research, the dissemination of the results could lead to new cultural practices. For example, the more widespread use of a relatively brief and data-based training procedure might lead to improved social relations in a variety of social contexts such as schools, businesses, and human service organizations. Because ACT involves the identification of values and commitment to action, it is possible that training might also contribute, at the group level, to long-term planning (and the reduction of the temporal discounting of large delayed reinforcers).

Cultural Processes

Cultural contingencies and cultural evolution were themes that appeared in many of Skinner's writings (e.g., 1948, 1953, 1971). The analysis of complex cultural contingencies and their effects certainly involve many conceptual and methodological challenges. Nevertheless, behavior analysts have made progress toward the development of such analyses. Cultural contingencies and the practical role of behavioral science in producing social change have been discussed in a number of books, such as Biglan (1995), Lamal (1991, 1997), and Mattaini and Thyer (1996). Discussions of cultural issues, social change, and behavior analysis may also be found in the journal *Behavior and Social Issues* (1991–2010).

These sources include data-based approaches to such community problems as child rearing, sexism, and tobacco use among teenagers, methodological issues involved with such

research (Biglan, 1995), and extended discussions of appropriate functional units of cultural analysis (e.g., Glenn & Malott, 2004, and commentaries). Additional themes include education (e.g., Crandall, Jacobson, & Sloane, 1997), the environment (e.g., Grant, 2010; Todorov, 2010; see also Chance & Heward, 2010), and discussions of Skinner's conceptions of cultural design (e.g., Glenn et al., 2001). The purpose of such a brief overview is simply to illustrate that, although still in the earliest of stages, an analysis of cultural contingences, practices, and development has begun in the science of behavior.

IMPLEMENTATIONS, IMPEDIMENTS, AND IMPLICATIONS

Resistance

Certain obstacles may stand in the way of science-based cultural change. In addition to the time needed for continued basic and applied research, attempts to implement cultural changes are characteristically met with resistance. Skinner (1987) described two types of such resistance. One type involves resistance from institutions, such as government, religion, and economic enterprises, which have large investments of various sorts in the status quo.

The other type of resistance may be expected from the very population for whom the cultural changes are designed to serve. This is because the current population has been taught to accept current practices, including the problems they incur in the short term as well as the risks they incur in the long term. From Copernicus to Darwin and Skinner, scientific ideas have often found resistance when confronting traditional conceptions (e.g., Skinner, 1971).

General Strategies

Planned experimental communities. General strategic proposals for cultural change have taken several forms. Perhaps the earliest proposal in the behavior-analytic literature is that of planned experimental communities (e.g., Skinner, 1948, 1953, 1969, 1971). Such communities would serve as laboratories for the discovery and development of adaptive cultural practices, which might then lead to further development in additional communities or the larger culture in which the communities have developed. Although some communities of this sort have appeared and have developed some practices based on experimentation, they remain small in number and have not had significant influence on the larger culture (e.g., Rumph, Ninness, McCuller, & Ninness, 2005).

The uncommitted and the public. In a commentary on Skinner (1987), Rumph et al. (2005) updated the worsening trends in energy, population, nuclear weapons, and the environment since Skinner's essay. Updated also was the possible role of the "uncommitted," or the "fourth estate," composed of journalists, the media, writers, scientists, scholars, and teachers, who tend to be more independent of institutional and popular resistance to cultural change. Skinner proposed that the uncommitted might play a key role in emphasizing current risks and long-term contingencies that involve survival and related issues. However, Rumph et al., noted that the uncommitted have often become less so over the years since Skinner proposed the idea, because economic forces have played a larger role in various forms of media. Nevertheless, the uncommitted might still play a key role for those scientists and writers who find ways to engage such sources to productive effect.

An example of what might be done with effective communication to the public was recently described by Critchfield (2010):

> How did behavioral interventions become a treatment strategy of choice for autism? Arguably, this outcome does not trace simply

to the tribulations of persons with autism, to a strong empirical literature documenting the effectiveness of applied behavior-analytic services, or to efforts to credential behavior-analytic providers and organize them as a political lobby. Instead, that catalyst seems to have been Maurice's (1994) popular press book,[1] which was read by highly motivated parents who were desperate for guidance about how to help their children and whose word-of-mouth campaign drove not only the sale of Maurice's book but also a revolution in consumer demand for services. (p. 142)

In a footnote, Critchfield added,

I acknowledge that this is an untestable proposition. We cannot know what might have transpired for applied behavior analysis had Maurice's book not appeared. My assertion, however, is grounded in the empirically supported principle that an effective technology may not be adopted unless something, like a good narrative, links it to the existing values, knowledge, and ways of speaking of potential adopters (Rogers, 2003). (p. 142)

If science-based cultural change is to occur in a democratic society, then effective ways of communicating the realities, methods, findings, and benefits of behavior-analytic science must be developed. Translating the technical methods and findings of science to the public can be a delicate matter. Nevertheless, Sagan's (e.g., 1980, 1994) books on astronomy were very popular, as were Greene's (e.g., 1999, 2004) fascinating attempts to translate the mathematics of general relativity, quantum mechanics, and string theory into ordinary language accessible to the general public.

Some behavior-analytic books and sources for the general public have appeared (e.g., Cambridge Center for Behavioral Studies, http://www.behavior.org; Sidman, 2001), but most in academia and the general public remain awash in misinformation (e.g., Morris, 2009; Palmer, 2006). More popular treatments are needed for the dissemination of behavior analysis to the general public (e.g., Schlinger, 2011). There are many stories to tell of a rigorous, interesting, consistent, comprehensive, and useful science of behavior.

Piecemeal progress. Perhaps a sort of default strategy for cultural change was suggested by Skinner (1971). In noting that utopian or planned communities have often failed, he added that the same can be said of unplanned communities, and continued, ''The real mistake is to stop trying. Perhaps we cannot now design a successful culture as a whole, but we can design better practices in a piecemeal fashion'' (p. 148). In a sense, behavior analysts are suggesting, if not designing, better practices as a natural outcome of pragmatically based behavior-analytic basic, applied, and clinical research and practice.

Other points of contact might include education, clinical psychology, and politics. Education is an area in which behavior analysis excels, and efforts might be made for new, organized, and focused attempts to influence the education establishment, perhaps indirectly through speaking to the ''potential adopters,'' the parents, in the sense described above by Critchfield (2010). Clinical psychology, which includes a large number of researchers and practitioners, has seen increasing influence from behavior-analytic perspectives (e.g., Dougher, 1993; Dougher & Hayes, 2000), especially acceptance and commitment therapy (e.g., Hayes et al., in press). Skinner had an eye to politics when, according to Chance (2007), ''In my conversation with Skinner, the only hope he held out was winning over a substantial number of influential people (e.g., educators, writers, journalists, scientists, and scholars) who might then pressure policy makers to take effective action'' (p. 158). Chance then added, ''The fact that we are doing next to nothing to win them over is perhaps further support for Skinner's view'' (p. 158). Perhaps, but as noted above, the uncommitted might still be recruited in disseminating behavior analysis and its contributions to adaptive cultural practices.

Another point of contact between behavioral science and practical cultural change may be found in a group of behavior analysts with exactly that specialized interest. Behaviorists for Social Responsibility (http://www.bfsr.org) is a Special Interest Group of the Association for Behavior Analysis International, and serves as host for the online journal, *Behavior and Social Issues* (http://www.uic.edu/htbin/cgiwrap/bin/ojs/index.php/bsi). Scanning the contents of the journal shows the range of interests in cultural problems, cultural analysis, and cultural change.

Readers interested in examples of what is being done, and what might be done, may also consult the work of Biglan (e.g., 2009; Biglan & Hinds, 2009) for both examples and resources. For example, Biglan and Hinds reviewed recent research and methodology for behavior analysis at the community level. Findings indicate that evidence-based community programs that target specific classes of problems (e.g., drug use or risky sexual behavior in adolescents) might also affect a variety of interrelated community problems. The authors propose an expansion of such community-based behavioral research and suggest ways of advocating such research and its beneficial products.

CONCLUSION

Nothing in this article has proven Skinner's later life pessimism to be wrong, and so it is not a proper answer to Chance's (2007) challenge. The purposes of this article were (a) to review Chance's list of maladaptive behavioral phenomena toward an examination of central themes, (b) to summarize research themes over the past 30 years that suggest ways in which those central themes might be addressed, and (c) to examine the conspicuous problems and possible strategies of implementation. The question of whether there is sufficient time to develop and implement effective strategies for change can only be regarded as an empirical one. The only proof of Skinner's later views, whether correct or incorrect, will be found in the future cultural evolution of human global civilization.

Perhaps Skinner's pessimism was misplaced. Clearly the human species has shown great progress in many areas over the past several hundred years. Perhaps, without the help of science, human global civilization will produce cultural variations that are selected by their effects to the extent that cultures will continue to solve problems, develop, and prosper. Given the number, magnitude, and development of global problems, however, we risk everything if the future is to depend on fortuitous accident. To paraphrase a remark by Skinner (1987) at the conclusion of his essay, we may be faced with a choice between a future guided by science or no future at all. Behavioral science is, and likely will remain, our only chance.

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